CLAIMS

1. A semiconductor device comprising:

a semiconductor substrate;

a gate insulator formed on the substrate; and

a gate electrode having a metallic compound film, the gate electrode being formed on the insulator,

wherein: the metallic compound film in the gate electrode is formed by CVD using a material containing a metal carbonyl, and at least one of a Si-containing material, a N-containing material and C-containing material; and

the metallic compound film contains the metal in the metal carbonyl and at least one of Si, N and C.

2. The semiconductor device according to claim 1, wherein the metal constituting the metal carbonyl is selected from the group consisting of W, Ni, Co, Ru, Mo, Re, Ta, and Ti.

3. The semiconductor device according to claim 1, wherein the metal carbonyl is $W(CO)_6$.

4. The semiconductor device according to claim 1, wherein the Si-containing material is selected from the group consisting of silane, disilane, and dichlorosilane.

5. The semiconductor device according to claim 1, wherein the N-containing material is selected from the group consisting of ammonia and monomethyl hydrazine.

6. The semiconductor device according to claim 1, wherein the C-containing material is selected from the group consisting of ethylene, allyl alcohol, formic acid, and tetrahydrofuran.

7. The semiconductor device according to claim 1, wherein the metallic compound film is doped with an *n*-type impurity or a *p*-type impurity.

8. The semiconductor device according to claim 1, wherein the gate electrode further comprises a silicon film formed on the metallic compound film.

9. The semiconductor device according to claim 8, wherein: the gate electrode further comprises a barrier layer formed between the metallic compound film and the silicon film;

the barrier layer is formed by CVD using a material containing a metal carbonyl, and at least one of a N-containing material and a C-containing material; and

the barrier layer is a film of a metallic compound containing the metal in the metal carbonyl and at least one of N and C.

10. A semiconductor device comprising:

a semiconductor substrate;

a gate insulator formed on the substrate; and

a gate electrode formed on the insulator,

wherein: the gate electrode comprises: a metal-containing electrically conductive layer; a barrier layer formed on the electrically conductive layer; and a silicon film formed on the barrier layer;

the barrier layer is formed by the use of a material containing a metal carbonyl, and at least one of a N-containing material and a C-containing material; and

the barrier layer is a film of a metallic compound containing the metal in the metal carbonyl and at least one of N and C.

11. The semiconductor device according to claim 10, wherein the metal constituting the metal carbonyl is selected from the group consisting of W, Ni, Co, Ru, Mo, Re, Ta, and Ti.

12. The semiconductor device according to claim 10, wherein the metal carbonyl is $W(CO)_6$.

13. The semiconductor device according to claim 10, wherein the N-containing material is selected from the group consisting of ammonia and monomethyl hydrazine.

14. The semiconductor device according to claim 10, wherein the C-containing material is selected from the group consisting of ethylene, allyl alcohol, formic acid, and tetrahydrofuran.